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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/707,805 | 01/13/2004 | Yi-Nan Chen | NTCP0027USA | 1804 |

27765 7590 10/06/2004

NAIPO (NORTH AMERICA INTERNATIONAL PATENT OFFICE)
P.O. BOX 506
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EXAMINER

GEBREMARIAM, SAMUEL A

ART UNIT PAPER NUMBER

2811

DATE MAILED: 10/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/707,805

Applicant(s)

CHEN ET AL.

Examiner

Samuel A Gebremariam

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of group I, claims 1-8 drawn to a semiconductor device is acknowledged.

Specification

2. The disclosure is objected to because of the following informalities:
paragraph 0008, line 11 the "trap" appears to be a typographical error. Appropriate correction is required.

Claim Objections

3. Claim 1 is objected to because of the following informalities: On line 10, the word "potion" appears to be a typographical error. Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

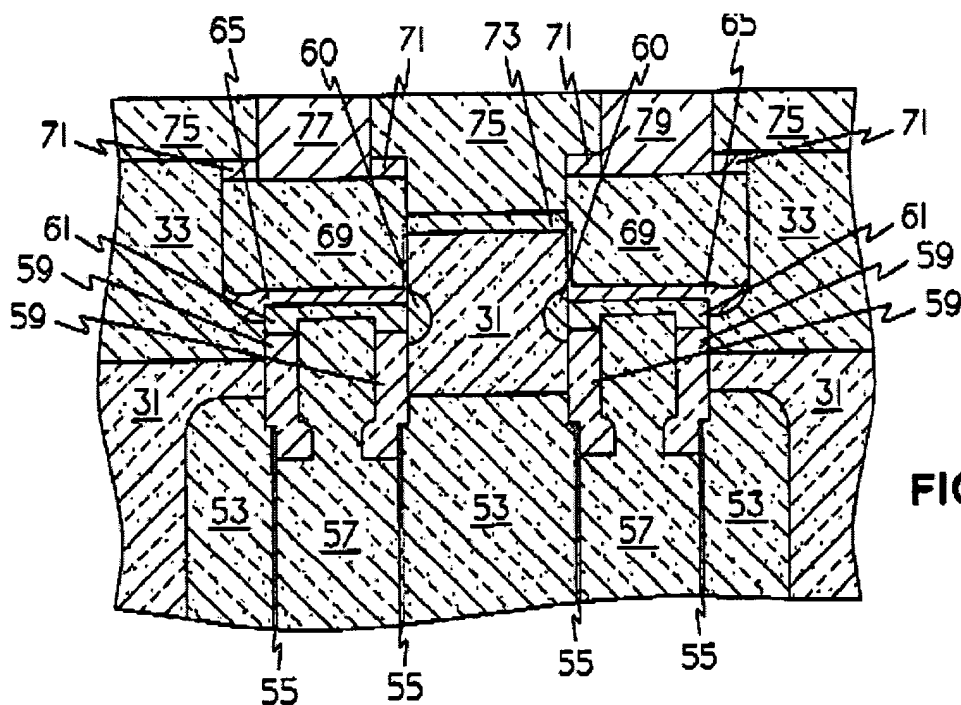
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-2 and 7 -8 are rejected under 35 U.S.C. 102(b) as being anticipated by Furukawa et al., US patent No. 6,333,533.

Regarding claim 1, Furukawa teaches (figs. 1-10) an isolation structure of a trench capacitor (75 in the middle, fig. 10), the trench capacitor being disposed in a deep trench (39) of a substrate (31) and comprising a conductive layer (57, 69) in the deep trench and a collar oxide layer (59) disposed on a surface of a sidewall of the

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deep trench, the isolation structure comprising: a first isolation portion (portion of 75 on the top left and right) covering the conductive layer and filling a top opening of the deep trench (fig. 10), the first isolation portion having a first thickness; and a second isolation portion (the isolation portion of 75 that is thicker) directly contacting the first isolation portion and surrounding the deep trench without overlapping the deep trench (fig. 10), the second isolation portion having a second thickness larger than the first thickness (the 2nd isolation portion goes deeper than the 1st isolation portion).

**FIG. 10**

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Regarding claim 2, Furukawa teaches the entire claimed structure of claim 1 above including the second isolation portion is disposed by a side of the collar oxide layer (59), near the conductive layer (57, 69) and the collar oxide layer (59) without being located on the conductive layer (57, 69).

Regarding claims 7 and 8, Furukawa teaches the entire claimed structure of claim 1 above including the first isolation portion and the second isolation portion are oxide layers (col. 6, lines 1-10).

The limitation of "the first isolation portion and the second isolation portion are oxide layers formed by a high density plasma chemical vapor deposition (HDPCVD) process" is considered a product-by-process claim. "[E]ven though product-by process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa in view of Alsmeier US patent No. 5,867,420.

Regarding claim 4, Furukawa teaches substantially the entire claimed structure of claim 1 above except explicitly stating the isolation structure further comprising an isolation liner disposed between the first isolation portion and the conductive layer, the second isolation portion and the conductive layer, and the second isolation portion and the collar oxide layer.

Alsmeier teaches the use of liner structure (fig. 2d, liner 255, and col. 4, lines 45-62) in the formation of an isolation structure in a trench capacitor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the liner structure taught by Alsmeier in the device of Furukawa in order to prevent oxygen diffusion.

The combined structure of Furukawa and Alsmeier would inherently teach the isolation structure having an isolation liner disposed between the first isolation portion and the conductive layer, the second isolation portion and the conductive layer, and the second isolation portion and the collar oxide layer.

Regarding claim 5, Furukawa teaches substantially the entire claimed structure of claim 1 above including the isolation liner comprises a nitride liner (col. 4, lines 45-62).

Regarding claim 6, Furukawa teaches substantially the entire claimed structure of claim 1 above including the isolation liner comprises an oxide liner (col. 4, lines 45-62).

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8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa in view of admitted prior art.

Furukawa teaches substantially the entire claimed structure of claim 1 above except explicitly stating that the bottom of the second isolation portion is lower than a top of the collar oxide layer.

Admitted prior art teaches (fig. 1) where the bottom of the second isolation portion (30) that is lower than the top of the collar oxide layer (22).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the height of the collar oxide layer and the bottom of the second isolation as claimed in the structure of Furukawa as taught by admitted prior art in order to provide better isolation.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References C-E are cited as being related to trench capacitor. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A Gebremariam whose telephone number is (571) 272-1653. The examiner can normally be reached on 8:00am-4:30pm.

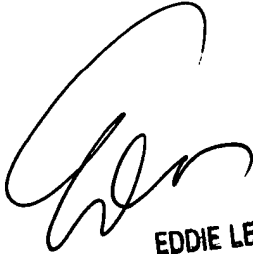
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAG

September 27, 2004



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SUPERVISORY PATENT EXAMINER
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